AS COMPUTER SCIENCE H046
JUNE MOCK EXAM
26/06/2025

Computing Principles +
Algorithms and Problem Solving

Name: _____

Mark: /111 Percentage:

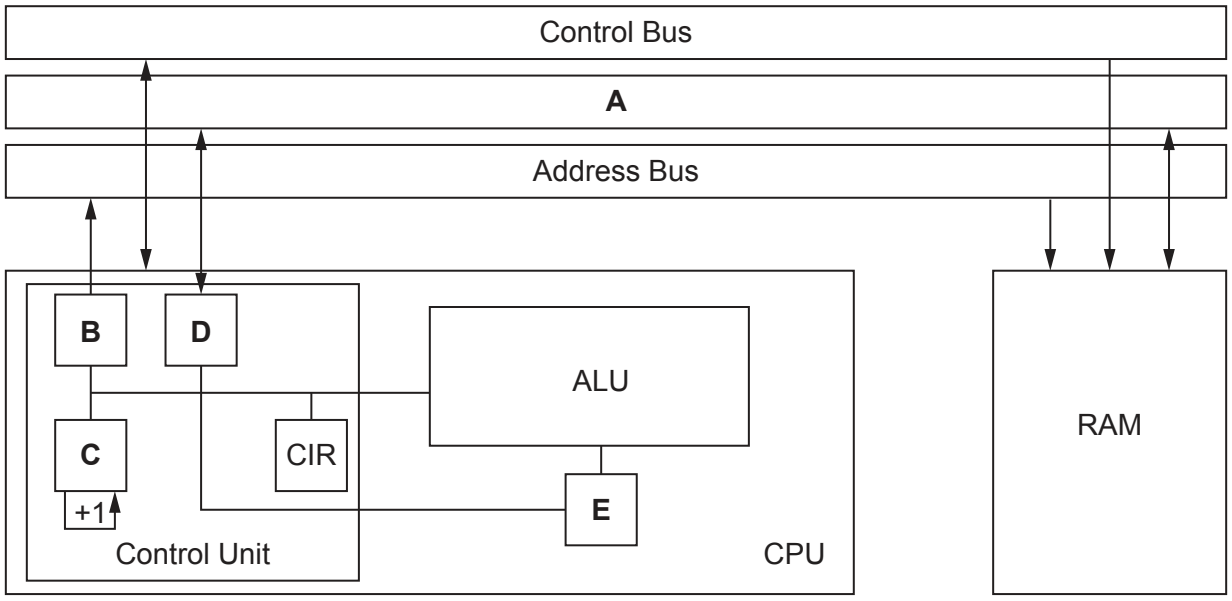
Grade:

JUNE 26, 2025

Note: Calculators are not allowed. Duration of exam: 2 hours. Answer all questions.

Section A - Computing Principles
Answer **all** the questions.

1 Here is a diagram of a computer system.



Identify each of the labelled components in this computer system.

A	
B	
C	
D	
E	

[5]

2* Most modern computers are designed using Von Neumann Architecture. However, in some cases Harvard Architecture may be preferred.

Discuss the difference between Von Neumann Architecture and Harvard Architecture.

You should refer to the following in your answer:

- the different approaches each architecture takes to storing instructions and data
- the benefits of using a Von Neumann Architecture approach
- the benefits of using a Harvard Architecture approach. **[9]**

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3 A secondary school is upgrading their computers. They decide to install “thin client” computers. A thin client computer is when users access their computer in the usual way with a keyboard, mouse and monitor. However, all processing takes place on the virtual machine on a server rather than the computer at their desk.

(a)

(i) Describe **one** advantage of using virtual machines in this way.

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..... **[2]**

(ii) Describe **one** disadvantage of using virtual machines in this way.

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..... **[2]**

(b) Each virtual machine will run an operating system. One type of operating system is multi-user.

Describe **two** other types of operating system and give an example of where each may be used.

TYPE 1

Description .....

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Example .....

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TYPE 2

Description .....

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Example .....

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[6]

(c) The virtual machines will have utility software and application software installed.

(i) Describe the difference between utility software and application software.

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..... **[2]**

(ii) The application software installed will be used by students to complete their school work.

Name **two** different types of application software that may be used by students, giving an example of how each may be used.

TYPE 1

Name .....

.....

Example .....

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TYPE 2

Name .....

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Example .....

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[4]

(iii) The application software installed on the virtual machines can be closed source software or open source software.

Explain **one** advantage to the school of using open source software.

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..... **[2]**

(d) Name **three** different types of utility software.

1 .....

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2 .....

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3 .....

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[3]

4 All source code needs to be translated into object code using a translator.

(a) Tick **one** box in each row to indicate which type of translator is being used.

	Compiler	Interpreter	Assembler
Creates an executable file			
Creates one line of object code for each line of source code			
Translates all the high-level code at once			
A program needs to be translated each time it is run			

[4]

(b) A software development company has written a new computer game in a high-level language.

Identify which type of translator would be the most suitable for the computer game and give a reason why.

Type .....

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Reason .....

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[2]

(c) The pseudocode algorithm here will take in two numbers from the user, multiply them together using addition and output the result. For example, 4 multiplied by 3 would be 4 + 4 + 4 = 12.

You can assume the function `input` takes in a value as an integer.

```
numA = input("Enter first number")
numB = input("Enter second number")

answer = 0

while (numB > 0)
   answer = answer + numA
   numB = numB - 1
endwhile

print(answer)
```

Write this algorithm in assembly language using the Little Man Computer (LMC) instruction set.

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..... **[6]**

5 An online shop uses a website to sell its products. Part of the HTML code that is used for a login form on the website is shown here.

```
<p>
   <label>Username:</label>
   <input type="text" id="userName">
</p>
<p>
   <label>Password: </label>
   <input type="text" id="Password" onchange="errorCheck()">
</p>
<p>
   <label id="errorText">
</p>
```

The `<label>` tag will instruct the user what information they need to enter. The code `onchange` will run a function called `errorCheck` automatically after a password has been entered. The function `errorCheck` will check that the password is a suitable length.

Write JavaScript code for the function `errorCheck` which:

- checks the length of the password is between 8 and 12 characters (including 8 and 12)
- displays the message “Password Length Error” in the HTML `label` tag identified by the id `errorText` if the length is not between 8 and 12 characters.

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..... **[5]**

6

(a) Using the binary value 1001 1101, convert this into:

(i) A positive denary number.

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..... **[1]**

(ii) A negative denary number using two's complement.

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..... **[1]**

(iii) A hexadecimal value.

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..... **[1]**

7 Elliott has designed a logic circuit. The expression he has created for the logic circuit is:

$Q = (A \wedge \neg B) \vee (\neg A \wedge C \wedge D) \vee (A \wedge B)$

(a) Complete the Karnaugh Map below to simplify this expression. Show your working.

CD \ AB	00	01	11	10
00				
01				
11				
10				

Simplified expression:

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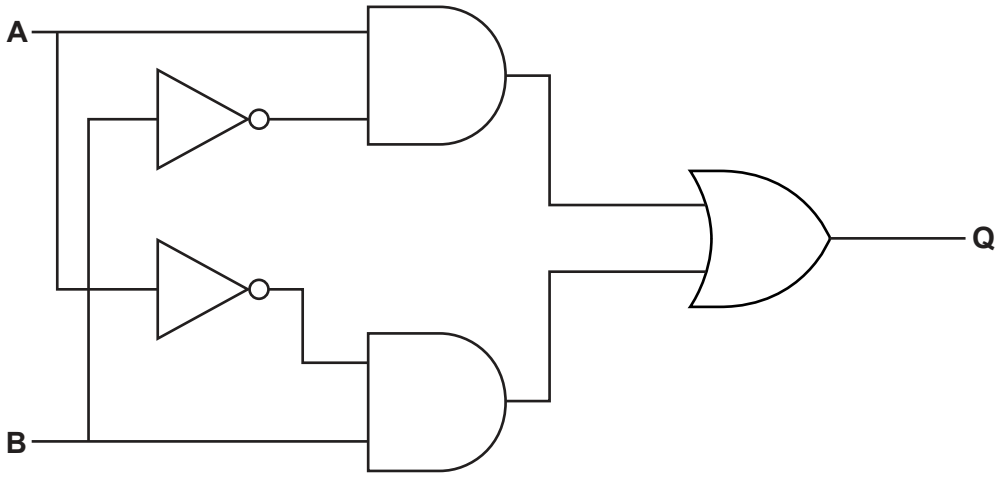
..... **[4]**

8

(a) A logic gate diagram is shown below.



(i) Complete the truth table for this logic gate diagram.

A	B	Q
0	0	
0	1	
1	0	
1	1	

[2]

(ii) What single gate is this logic gate diagram equivalent to?

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..... **[1]**

Section B - Algorithms and Programming

Answer **all** questions.

9 Eve enjoys playing board games. Her favourite board game is called “Pot Luck”. This has a numbered grid of 10 squares by 10 squares. Each square has a number between 1 and 100.

Players place their game counters on square 1. A 30-minute timer is set which counts downwards. Each player rolls two 6-sided dice and then moves their game counter that number of squares. Some squares tell the player to pick up a card. These have instructions on, such as ‘Move forward 10 spaces’. If the player lands on one of these squares they move according to the instruction on the card. The first player to land on square 100, is announced as the winner. If no winner is announced before the timer runs out, then it is a draw.

(a) Eve would like to create a computerised version of this game.

(i) She has been told that she should make use of abstraction when creating the game.

Describe what is meant by the term ‘abstraction’.

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..... **[2]**

(ii) Give **three** examples of how Eve could use abstraction when creating her game.

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2 .....

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3 .....

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[3]

(iii) Give **two** reasons why Eve should use abstraction when designing the game.

1 .....

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2 .....

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[2]

(b) Eve would like to break the problem down into smaller sub problems so that each sub problem will complete one specific task.

Identify **three** sub problems that Eve can use in her game.

1 .....

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2 .....

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3 .....

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[3]

(c) Logical conditions are checked once a player has rolled the dice.

Describe **two** different logical conditions and how the result will affect the outcome of the game.

Logical Condition 1

Condition: .....

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Outcome: .....

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Logical Condition 2

Condition: .....

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Outcome: .....

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[4]

10 A programmer is designing a program that will store data.

The programmer is deciding whether to store the data in a stack or a queue.

(a) Identify **one** similarity and **one** difference between a stack and a queue.

Similarity .....

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Difference .....

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[2]

(b) The pseudocode function, `enqueue`, inserts an item into a queue.

```
01  function enqueue(item)
02          if tailPointer >= queue.length then
03                return false
04          else
05                queue[tailPointer] = item
06                tailPointer = tailPointer + 1
07                return true
08          endif
09  endfunction
```

(i) Give the name of the parameter in the function `enqueue`.

..... **[1]**

(ii) Give the name of **one** global variable that is used in the function `enqueue`.

..... **[1]**

(iii) Describe **one** benefit and **one** drawback of using global variables instead of parameter passing in a subroutine.

Benefit .....

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Drawback .....

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[4]

(iv) The function `enqueue` can be called by the main program.

Explain why the function `enqueue` returns true or false values, and how this can be used by the main program that calls the function.

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..... **[3]**

(v) The pseudocode function, `dequeue`, removes and returns the first item in the queue. If the queue is empty, the function returns the string `"EMPTY"`.

```
01  function dequeue(data)
02          if headPointer != tailPointer then
03               return "EMPTY"
04          elseif
05               value = queue[headPointer]
06               return value
07               headPointer = headPointer + 1
08          endif
09  endfunction
```

The function `dequeue` has **several** errors.

Identify the line number of any **three** errors **and** state the correction required.

Error 1 Line Number .....

Error 1 Correction .....

Error 2 Line Number .....

Error 2 Correction .....

Error 3 Line Number .....

Error 3 Correction .....

[3]

(vi) The programmer has corrected all of the errors in the function `dequeue`.

The main program repeatedly calls the function `dequeue` until all of the elements in the queue have been output.

Write the main program using pseudocode or program code.

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11* Kofi and Zac both write a different pseudocode algorithm to read the data from a text file into an array.

Kofi's Algorithm	Zac's Algorithm

`fileName = "data.txt"`
`fileToRead = openRead(fileName)`
`for x = 0 to 1000`
`  anyData = fileToRead.endOfFile()`
`  if NOT anyData then`
`  x = 1001`
`  else`
`  dataValue = fileToRead.readLine()`
`  array[x] = dataValue`
`  endif`
`next x`
`fileToRead.close()`
	`function readData(fileName)`
	`  array data[100]`
	`  x = 0`
	`  fileToRead = openRead(fileName)`
	`  while NOT fileToRead.endOfFile()`
	`  data[x] = fileToRead.readLine()`
	`  x = x + 1`
	`  endwhile`
	`  return data`
	`endfunction`

The solution needs to be used in different programs. Each program will use a different text file where the number lines in the text file is unknown.

Compare the suitability of each algorithm for the given problem.

You should include the following in your answer:
- the suitability of the programming techniques including the use of loops
- how effectively the solution meets the requirements.

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12 Charlie is developing a computer game using a development lifecycle.

(a) Complete the table by describing each method of software development.

Method	Description
Extreme programming	....
Waterfall lifecycle	....
Spiral model	....

[6]

(b) Charlie uses alpha testing.

Describe what is meant by 'alpha testing'.

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..... **[3]**

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page. The question number(s) must be clearly shown in the margin(s).

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